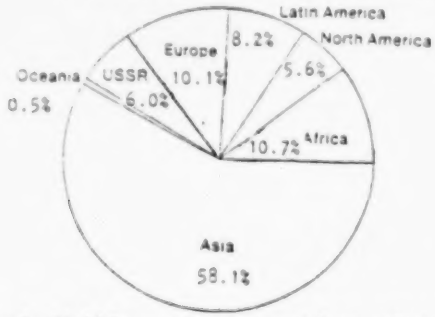
"What are the global consequences of waste in the United States and other affluent countries?" "How serious is the population explosion?" Concepts of interdependence, change, communication, and conflict can be used as organizing themes for discussion and as a context for information gathering and further inquiry.

POPULATION

PROBLEM 1. The circle diagram below shows the percentage of people living in various regions of the world.



a) Where do most of the world's people live? (Can you name the two countries in that region which have the most people?)
b) What percentage of the world's people live in the generally developing regions: Asia, Africa, and Latin America?
c) For every 1,000 people in the world, how many live in Europe?

Mathematical Skills: Interpreting circle charts, addition, ratios, proportion.

Solution:
a) Asia (China and India)
b) 58.1% + 10.7% + 8.2% = 77.0%
c) $\frac{10.1}{100} = \frac{x}{1000}$ $\quad 100x = 10100$ $\quad x = 101$ people

Relevant Global Issues: A review of the circle chart shows clearly the world population distribution among major world regions. Relate population to the use of resources. Only 5.6% of the world's people, for example, live in North America, yet the U.S. alone uses about 35% of the world's resources and energy. This can lead to a discussion of the relationship between disproportionate consumption in affluent countries, and such global problems as pollution, resource scarcity, hunger, military threats, and inflation.

PROBLEM 2. At current growth rates it will take 20 years for Nicaragua's population to double. At this rate, how many people will there be in Nicaragua in a century, for every one there today?

Mathematical Skills: Sequences, division, word problems.

Solution: $\frac{100 \text{ years}}{20 \text{ years}} = 5$ doublings in a century

2.2.2.2.2 = 32

Relevant Global Issues: This result, 32 Nicaraguans in a century for every one there today, shows dramatically the rapid population growth being experienced by Nicaragua and other developing countries, and the need for effective steps to reduce this growth. What effects might housing, jobs, education and food have on population growth?

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Study a European country such as Sweden, West Germany, East Germany, or Austria which are now at or near zero population growth. Compare what you learn with similar information about Nicaragua.

Reference: "Population Facts in Hand", 1980, available at UNFPA, New York.

POVERTY AND ITS EFFECTS

PROBLEM 3. For every $1 spent in El Salvador for goods and services per year, there are about $12 spent in Japan. If about $7400 were spent on goods and services on the average for each person in Japan in 1980, about how much was spent per person on the average that year in El Salvador?

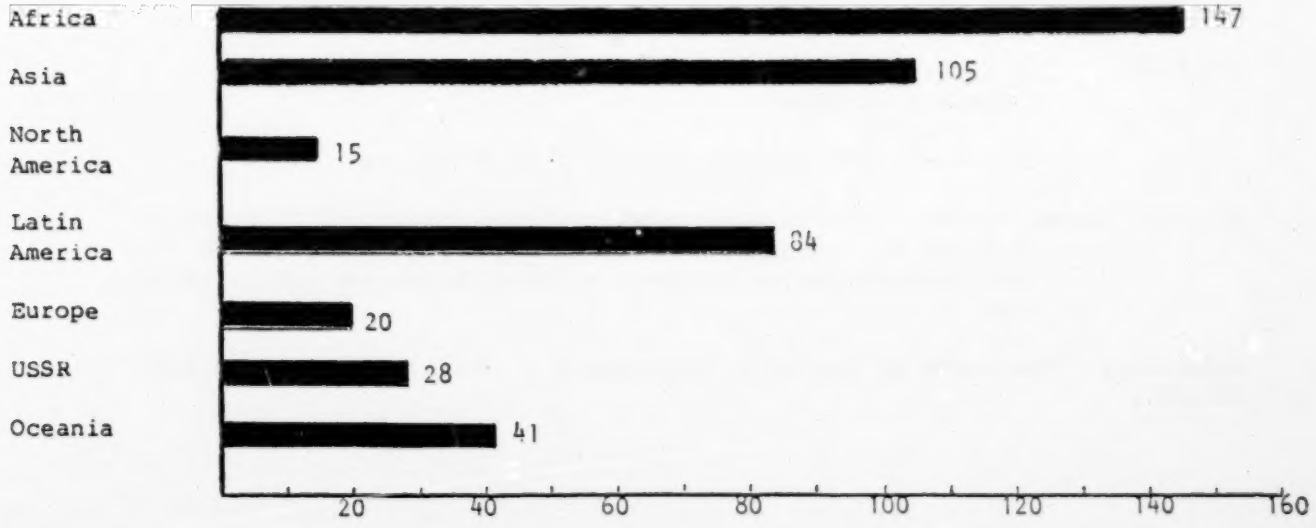
Mathematical Skills: Ratios, proportion, division, word problems.

Solution: $\frac{\$12}{\$1} = \frac{\$7400}{\$x}$ $\quad 12x = 7400$ $\quad x = 616.6$

Relevant Global Issues: This problem gives students an idea of the economic gaps which exist between nations. This can lead to a discussion of the consequences of poverty and the relationship between per capita GNP and political stability. The current civil unrest in El Salvador and the recent revolution in Nicaragua can be discussed, using other population and economic data for these countries.

The economic gaps between other countries are even greater. For example, the per capita GNP of Switzerland is one hundred times greater than that of Mali and over one hundred and thirty times greater than that of Bangladesh.

PROBLEM 4. The bar chart below shows the annual number of deaths of infants under one year of age per 1,000 live births.



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a) What is the range (highest-lowest) for the annual number of deaths of infants under one year of age per 1,000 live births? b) What is the ratio of values plotted for Asia as compared to USSR? Africa as compared to Europe?

Mathematical Skills: Interpreting bar charts, range, subtraction, ratios.

Solution: a) 147 - 15 = 132 infant deaths per 1000 live births

b) $\frac{105}{28} = 3.75$ $\frac{147}{20} = 7.35$

Relevant Global Issues: This problem shows that in spite of recent progress in reducing infant mortality in many areas of the world, it is still extremely high in some regions. The range and ratio calculated show the result of the shocking disparities in income, health care, and nutrition between the wealthy and poor nations. It is interesting to note that the two countries with the lowest infant mortality rates are Sweden and Japan, where eight children per one thousand die before the age of one.

References: "World's children data sheet", 1980, Population Reference Bureau Inc. produced in collaboration with UNICEF, available at UNICEF offices. And "Population Facts at Hand", 1980, available at UNFPA, New York.

WASTE IN AFFLUENT NATIONS

PROBLEM 5. It has been estimated that the average Western European has fifty times the impact on the environment (in terms of resource consumption and pollution) as does a person in a developing country such as India, Nigeria or Honduras. How many people in the developing countries have the same impact as 215 million Western Europeans (the total population of the United Kingdom, Federal Republic of Germany, France, Belgium, the Netherlands, Sweden, Denmark and Norway)?

Mathematical Skills: Ratios, large number comprehension, word problems, multiplication.

Solution: $\frac{50 \text{ Indians}}{1 \text{ Western European}} \cdot 215 \text{ million Western Europeans} =$

10,750 million Indians, Nigerians or Hondurans

Relevant Global Issues: This problem helps students understand that global problems are not primarily due to rapid population growth, but that consumption and waste in affluent countries play a large role.

Reference: "The State of the World Environment", 1980, available from UNEP, Nairobi.

THE ARMS RACE

PROBLEM 6: In 1977, the world spent about $400 billion for the military, an amount approximately equal the annual income of the world's poorest two billion people (almost half of the world's population). Estimate the average income of the world's poorest two billion people.

Mathematical Skills: Ratios, large number comprehension, word problems, division.

Solution: $$\frac{\$400 \text{ billion}}{2 \text{ billion people}} = \frac{\$X}{1 \text{ person}}$$

$X = 200$

Relevant Global Issues: This problem illustrates two important global issues: (1) tremendous military expenditures at a time when so many human needs are not being met; (2) widespread poverty among so many of the world's people.

PROBLEM 7. In 1973, the Pakistani government spent two-thirds of its national budget for the military. If its total national budget were about $600 million dollars,
(a) approximately how much was used for the military?
(b) what percent of its budget went to the military?

Mathematical Skills: ratios, proportion, percentage, word problems.

Solution: (a) $\frac{2}{3} = \frac{\$X}{\$600 \text{ million}}$

$3X = 2(600 \text{ million})$

$X = 400 \text{ million}$

(b) $\frac{2}{3} = \frac{X}{100}$ $\quad 3X = 200 \quad X = 66.7\%$

Relevant Global Issues: This problem illustrates the very large proportion of national budgets spent by some developing countries on military expenditures, while many people in these countries lack adequate nutrition, health, housing, education and employment.

Reference: "An Approach to Peace Education", UNICEF Development Education Kit No. 6, available at UNICEF offices.

GLOBAL HUNGER

These problems are most effective when introduced by some startling statistics about world hunger. For example: about half of the world's people do not get sufficient food; every year ten to twenty million people die of hunger and its effects; over 100,000 children per year go blind because of vitamin A deficient diets.

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PROBLEM 8: (a) About 4/5 of all grain produced in Canada is fed to animals. What percentage does this represent?
(b) The average diet in Canada requires about 3.5 acres per person. The diet of an average person in many developing regions of the world requires about 0.2 acres. What is the ratio of the number of acres required by a person in Canada compared to that required by a person in a developing country?

Mathematical Skills: Fractions, percentages, ratios, word problems.

Solution: (a) $\frac{4}{5} = \frac{X}{100}$ $\quad 5X = 400 \quad X = 80\%$

(b) $\frac{3.5 \text{ acres}}{0.2 \text{ acres}} = \frac{17.5 \text{ acres}}{1 \text{ acre}}$

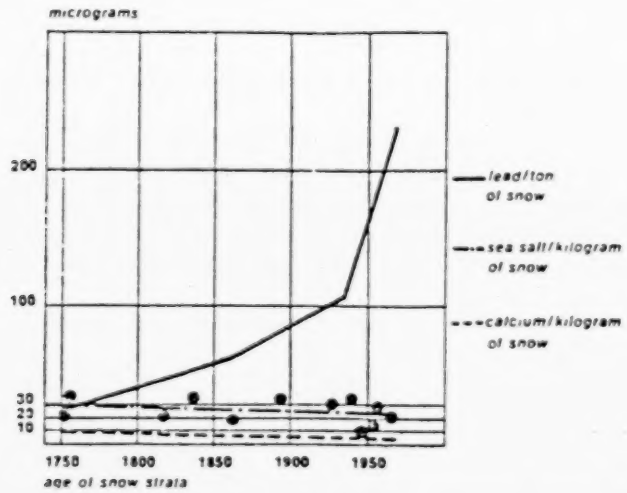
Relevant Global Issues: These facts and problems can stimulate discussion on food/hunger issues and distribution systems. The mathematical solutions indict meat-intensive "Western" diets. While nearly half the world is malnourished, about 80% of the "Western" grain supply is fed to animals destined for slaughter. Land which could be used to grow nutritious crops for all of the world's people are used to provide a luxury diet for the affluent.

Reference: "The State of Food and Agriculture", 1980, available at FAO, Rome.

POLLUTION:

PROBLEM 9:

Greenland ice cap (micrograms of lead per ton of snow)



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a) What was the approximate lead content in the Greenland ice cap in (1) 1900? (2) 1950?
b) In about what year was the lead content (micrograms of lead per ton of snow) equal to (1) 100? (2) 200?
c) What might explain the sharp rise in lead content between 1930 and 1970?

Mathematical Skills: Reading and interpreting graphs.

Solution: a) (1) 80 micrograms/ton (2) 160 microgram/ton
b) (1) 1925 (2) 1960
c) the large increase in cars using lead-based gasoline

Relevant Global Issues: This shows the sharp increase in the lead content in the Greenland ice cap. It illustrates that pollution is a global problem since much of the lead results from the burning of gasoline in the industrialized nations far away from Greenland. Similar graphs are drawn in The Limits to Growth to show increases in thermal heat, carbon dioxide in the atmosphere, nuclear waste from power plants.

Reference: D. Meadows, et al, The Limits to Growth, New York, Signet, 1972, p.80.

SOME CLASS ACTIVITIES RELATED TO GLOBAL ISSUES

Class interest in global issues can be enhanced in many ways:

News and magazine articles can be discussed. There are generally several articles daily related to global issues. These help show the relevance of the mathematics covered to every-day events.

The course can be related to events such as Universal Children's Day or to United Nations Conferences (such as the recent ones on population, hunger, environment, water resources, habitat, desertification and disarmament).

Films, filmstrips and slide presentations like those available at UNICEF offices can be used to improve student awareness and understanding.

Students can be required to report to the class on some global issue that they have researched, using mathematical concepts they have learned. Some potential topics include solar energy, noise pollution, threats to whales, population growth in some country, pesticides, world hunger, a local environmental issue, minority groups in own country, and surveys of student opinion on various issues.

The material can be related to other subjects the students are learning such as history, geography, science and political systems.

Through making mathematics part of development education, students become aware of global threats and the need for fundamental changes to avoid future crises.